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ABSTRACT

Speech communication workers have been reluctant to use physiological variables in their work. The arguments against their use have ranged from a fear of invading the realm of the psychologist or physiologist, thereby damaging the uniqueness and disciplinary identity of speech communication, to a feeling by certain scholars that the appropriate level of analysis and theorizing in communication research is that of physical behavior, cognition, and emotion. No research method or approach, however, is the exclusive property of any discipline. Similarly, theory and methodology are inexorably intertwined. It is logical to limit the methods used to inquire into a process, but only after gaining an understanding of that phenomenon. Precipitous selections of methodologies may hinder the discovery of important variables. The area of physiological variables has great potential for communcation research. Many of the problems with data collection encountered in the past are being eased by using computers to monitor physiological measuring instruments. Many speech communication theories derive from or involve physiological variables, and these require testing. Physiological variables can be measured with a degree of precision and accuracy usually unattainable with more common forms of communication measurement, and they can provide hard data with which to link communication research more firmly to the real world. Physiological measurement, however, should not be a communication researcher's only approach to a problem. It has value only when used in concert with other strategies. (RBW)

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THE FUTURE OF PHYSIOLOGICAL VARIABLES IN COMMUNICATION THEORY

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THE FUTURE OF PHYSIOLOGICAL VARIABLES IN COMMUNICATION THEORY

A review of our journals reveals a rather consistent methodological perspective. Studies typically focus on words, language, and symbol-using as consciously generated by subjects. When researchers deviate, it is usually to study the overt physical behavior of subjects, either consciously or unconsciously intended. Internal processes are considered explanatory constructional linkages in our theories, but are seldom tested directly.

This paucity of direct investigations of internal processes by speech communication researchers may be due to any number of apparently relevant and logical causes. It is the contention of this paper, however, that the opposite view is more compelling. Important and otherwise unreachable data lies hidden within the "skin" of the individual.

Following the McDonald's massacre in San Ysidro last summer, the news analyses by TV commentators included several updates on an autopsy report which focused on the gunman's brain. For several days after the incident, a number of editorials and commentaries speculated that some obvious abnormality would be found. Such speculations seemed absurd to many persons, and no such abnormalities were found. This assumption of absurdity may be based on the belief that the phenomenal functioning of human beings is

essentially independent of obvious physical characteristics of the physical brain. Failing to hold this assumption smacks of a type of internal physiognomy, wherein the bumps on one's head are seen as more indicative of behavior and personality than is a person's belief system and mental functioning. The commentators who broadcast these speculations seem naive indeed, almost a throwback to an era of phrenology and quasi-science.

Perhaps it is this sense of the absurdity of phrenology and similar theories of human behavior which lead to an apparent distrust of physiological research by many scholars of human communication. If head bumps and brain autopsies are not the path to follow, of what use are physiological measures? Isn't the use of heartrates, other polygraph measures, and physiological measurement in general, as absurd on the face of it as the broadcasts of the commentators?

A second cause of distrust of physiological measurement may be in a type of "reverse psychology" reaction against the physical sciences in general by a major portion of the scholars in human communication. The very fact that news commentators would speculate on a physical cause for abnormal behavior is indicative of our current society's value system. The research funds available for physiological research dwarf those for the humanities and non-physiological social science research combined. The "science" section of the New York Times is exceptionally fond of publishing any physiological explanation of human behavior which may be supported by research, but the Times is seldom so generous with its space when considering the far more numerous studies which support a non-physiological explanatory basis for

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behavior. If members of our profession do not react against this thrust then who will?

Finally, the very weight of studies which supports a non-physiological explanation of behavior seems to some an argument against physiological research in human communication. With so many studies, and rhetorical and non-rhetorical theories alike, offering tested and replicable explanations for the workings of human communication, what need can there be for physiological explanations? Doesn't the very preponderance of evidence show that physiological explanations are either wrong or unnecessary?

The answer is, obviously, no. Physiological explanations are no less legitimate because they are overadvocated nor because they are overfunded. And while the weight of evidence in human communication research supports non-physiological explanations, this says nothing about the potential validity, to say nothing of the potential utility, of physiological explanations in our research. Given the current extent of research in physiological explanations of human communication behavior the future of the field may well be characterized as a mine waiting to be tapped.

This paper will counter the arguments against using physiological responses as measures in communication research and discuss how such investigations could be used to validate existing theoretical orientations as well as to enrich future inquiries into the nature of communication processes.

Delimination Arguments

Possible justifications for limiting our investigatory pursuits range from purely philosophical arguments to seemingly compelling pragmatic considerations.

Some argue from a "territorial imperative" perspective. They argue that we should focus our research on words, language, and symbol-using as manifest on the conscious level of the communicator. We should find the "center that holds." We should not investigate physiological processes lest we invade the realm of the psychologist or physiologist, thus damaging our sense of uniqueness, our disciplinary identity.

While such an argument is emotionally compelling, it does not justify limiting our methodology by eliminating physiological data collection. We currently intrude on the domains of the psychologist, the sociologist, the historian, and the philosopher by using "their" methodologies, publishing in "their" journals, and using "their" studies in our footnotes. No research method or approach is the exclusive property of any discipline. Carleton (1979) presents both substantive and functional rationales for treating communication as an "inherently interdisciplinary field."

> Because speech communication is situated where biophysical, conceptual, and social processes meet and where they exercise mutual influence over one another, students and scholars in speech communication must resist theoretic provincialism focusing on only one of these domains. (p.333)

Other "centers that hold" can be established that allow us to delimit our discipline, not by the methodology imposed by tradition, but by the phenomenon we wish to study. Goldberg's (1983) suggestion of another "center" allows for a pluralistic approach for the speech communication scholar.

> Any event that involves one or more symbol users and/or that can be associated with the generation of or the sharing of meaning or that includes actions that can be described as communication acts whether they occur on an intrapersonal, interpersonal, group, organizational, or interorganizational level is part of the content of the discipline. (p. 2)

No methodology or research approach belongs exclusively to any discipline. However, just because we can use any of these methodologies does not allow us to conclude we should utilize them. A strong argument can be made that physiological data will not necessarily help us build speech communication theories relevant to our discipline.

Some of our colleagues feel that the appropriate level of analysis and theorizing for the communication scholar is that of physical behavior, cognition, and emotion. The reasoning behind this stand seems to us to represent a philosophical acceptance of the "mind-body" dichotomy. While the level of analysis of a problem must be consistent with the level of information desired as an answer to the problem, disallowing physiological data from consideration argues that that information is solely "structural."

> If one were interested in learning how a computer were wired, a physiological analysis of the computer would be appropriate. But if one were interested in a question such as "I wonder what language this computer is currently doing its computations in?" an input-output or a software analysis would answer the question far more easily than a look at the state, or changes in state, of the computer's circuits (Roberts and Steinfatt, 1983, p. 340-341).

Watzlawick et al (1967) suggest we should concentrate on specific input-output relations and not worry about the internal workings of the "black box" that is the human being. "While it is true that these relations may permit inferences

into what 'really' goes on inside the box, this knowledge is not essential for the study of the function of the device in the greater system of which it is a part" (pp. 43-44).

Counters to Anti-Physiological Stances

Such anti-physiological stances can be countered on several levels. First, as Moran and Halfond (1982) point out, even Watzlawick couldn't maintain this restriction in his theorizing about communication. Second, theory and methodology are inexorably intertwined. It is logical to limit the methods we use to inquire into a process, but only after we have an understanding as to the nature of the phenomenon at hand. Precipitous selections of methodologies may prohibit us from discovering important variables.

Premature Closure

It would seem prudent to discover first what it is that we should be studying, before deciding what method we should use to study it. As Lana (1969) pointed out, there have been many instances of logical and empirical limitations being placed upon theory building. "Theorists have embraced a particular methodology as being relevant for obtaining information about a given subject matter before they possessed any particular theory to explain it" (p. 126). He gives several pertinent examples of how this may disallow the discovery of important processes.

> To insist that all "meaningful" social behavior must be studied in toto and in situ may disallow the possibility that a researcher may discover that a good part of this behavior involves a simpler process, for example, fear conditioning (p. 126).

Mind-Body Dualism

Another argument against such a methodological narrowing is that it is based on the assumption that "mind" and "body," "cognition" and "neurological activity" are unrelated. This orientation has tended to create mentalistic theories which further reinforce the dualistic conceptualization of "mind and body" and have restricted consideration of physiological variables.

The simple fact is that all of the communication within the individual is physiological. While we can create fine mentalistic concepts of cognitive processes, those processes all are carried on through one physiological process or another.

The dualist sees the "mind" as being different from the "body" and seems to treat the mind as some nonphysical, unpositioned entity. The materialist sees mental states as being completely reducible to physical states. Both views have their own philosophical problems. The fact of the matter is, the mind is part of the body, and causal connections do exist. Further, for better or worse, regardless of how the materialists want to theorize, the concept of mental causation is deeply ingrained in everyday language and in their own theorizing about human behavior. We talk about, think about, and behave as if our mind, both as a physical concept and a psychological concept, operates our body.

Fodor (1981), in his discussion of the "Mind-Body Problem," writes about how "functionalism" makes sense of both the causal and relational character of the mental construct. While he does not believe that mentalistic concepts will ever be eliminated from the explanatory apparatus of

psychological states, he recognizes that mental particulars may be physical; mental causation is a species of physical causation. "It is possible for the functionalist to assent both that mental properties are typically defined in terms of their relations and that interactions of mind and body are typically causal" (p. 119). For the functionalist, mental states are defined in terms of their causes and effects.

While some physiological variables may entail "structural" analysis, others can be more accurately interpreted as "input-output" data. If physiological data are interpreted in this manner, then the level of analysis and the information desired would be consistent.

Thus conceived, physiological data could provide an alternative to self-report instruments and the observation of overt behaviors. All too often our focusing on discourse analysis alone creates a mentalistic maze of theorizing, a tautological Gordian Knot that can not be unraveled using "traditional" methodology. What may be needed is a new perspective, a cutting edge that can sever through our constructs and test the basic theoretical links of our theories in addition to the consequences we posit must follow from them. Such physiological assessment of "mental concepts" and basic cognitive processes has been deemed appropriate by a number of researchers. Martin (1961), Behnke and Carlile (1971, Myers (1974), Dabbs and Moorer (1975), Behnke and Beatty (1981), and Roberts and Steinfatt (1983) among others have used forms of physiological data to investigate cognitive processes.

The importance of this point cannot be overstressed. Human communication theories tend to be stated in terms which are not directly testable. Testable propositions are usually derived from these nontestable statements. Quite

often, a physiological state is hypothesized as in intervening variable between the theoretical statements and the testable propositions. But the existence of this state is never directly tested. Rather, the derived propositions are tested alone. If the data support the propositions it is often assumed without proof, and often without acknowledging the assumption, that the physiological mechanism posited has received support from these data. If the data do not support the proposition, the question of whether the hypothesized physiological state ever existed is normally left unanswered. The logic of research would seem to demand that if a physiological state is posited as a precursor to a communication variable of interest, the existence or non-existence of the posited state of that variable must necessarily be tested regardless of whether the data support the derived propositions. If the propositions are supported and the physiological variables are not tested, we cannot be sure that the posited mechanism was the mechanism which occurred in this instance. If the propositions are not supported and the physiological variables are not tested, we cannot know whether the posited conditions for the truth of the derived propositions even existed in the experimental conditions. Thus, tests of derived propositions concerning human communication, which involve directly stated or implied tests of physiological intervening variables, are necessarily incomplete until the existence or non-existence of the required states of the physiological variables has been established.

Relationships, Culture, and the Social Milieu

An acceptance of the usefulness of physiological data by speech communication researchers might not be enough to prompt them actually to gather

such information or to incorporate such findings in their theories. It could be argued that there are many situations where the focus should be on the interaction between communicators, on the content of their discourse and not on the processes that go on within individuals. Research that seeks understanding of culture, of society, would benefit little from the tangential physiological changes of individuals within a social milieu.

The proponents of such a stance might deign to allow intrapersonal theorists to investigate (and even report) physiological phenomena, but would see no reason to worry about such covert happenings themselves. Physiological inquiry is fine for some, but they have no interest in it. In any case, by fractionating the investigation of communication into manageable problem units, by investigating cognitive aspects and letting others investigate physiological concepts, the "task" of theory building can be done. The opposing argument would suggest a parallel with the tale of the six blind men and the elephant. The task of reconstructing the whole may be as difficult given this approach as it was for "all the king's men."

Physiological variables function even in interpersonal and mass settings, and the collection of data pertaining to their functioning has proven useful to researchers. Fletcher (1981) discusses using the mass registration of physiological responses to evaluate cultural responses. Dabbs and Moorer (1975) found physiological correlates of social interaction. The advertising industry and the educational testing field have likewise put such procedures to good use (Fletcher, 1981). The common link or element in all communicative events is the individual communicator. While the individual may move from interpersonal to public to intercultural context and be affected by those

contexts in different ways, he remains relatively stable. That is, he may encode or decode differently in the various contexts, but the "hardware" and "software" he brings with him to each communication encounter changes slowly. It is the individual who is the "eye of the storm." It is in him and by him that order is given to the "booming, buzzing confusion" about him. Our investigation of that individual should not be limited by the social environment he is found in or by the methodological perspective that we bring with us to the research task.

Such a stance runs counter to the view of the Batsonian interactionists. They hold that the relationship between, not the person within, is the center of concern. It is not our intent here to argue the primacy of the individual versus the relationship, to the study of human communication. Rather, we would point out that ultimately, both the concept of the "individual" and the concept of the "relationship" are reifications: they are constructs we create to explain communication phenomena. Neither the individualistic nor the relationship approach can ignore the physical existence of the human beings upon which their conceptualizing centers. To do so results in the same logically incomplete explanation in both instances.

Some Areas Require Physiological Explanations

It is possible that some human behavior can not be understood without knowledge of an individual's physiological state. Behnke and Beatty suggest that "neither physiological arousal not cognitive perception alone fully account for a particular emotion" (Behnke and Beatty, 1981, p. 159). Both need to co-act to produce the emotion. It is evident that the nonconscious level can be examined only indirectly, save with the use of physiological

measurement. Self-reports concerning nonconscious processes are often not available. Indeed, the concept itself seems to be an oxymoron. "One of the most striking facts about self knowledge is that it may be lacking" (Skinner, 1953, p. 288).

All psychological processes, whether part of the behavioral environment or part of the reflexive system of the organism, are ultimately products of the organism's physiology (Lana, 1969).

This is not to say that we will ever be able to achieve the "ultimate solution" suggested by Skinner (1953).

> Eventually a science of the nervous system based upon direct observation rather than inference will describe the neural state and events which immediately precede instances of behavior. We shall know the precise neurological conditions which immediately precede, say, the response, "No, thank you." These events in turn will be found to be preceded by other neurological events, and these in turn by others. This series will lead us back to events outside the nervous system and, eventually, outside the organism. (p. 28)

A more reasonable middle ground is suggested by Lana (1969).

> There is no logical reason why a great deal of psychological principles now and in the future may not be reducible to some of the derivatives of current or future physiological . . . theories (p. 145).

Areas of Likely Physiological Theorizing

Much human activity may be impossible to explain by a physiological-reductionist approach, but many phenomena, from recency-primacy (Lana, 1969, p. 152), to the effect of ethos on retention (Roberts and Steinfatt, 1983) may be explained physiologically.

As Bostrom (1980) suggests in the area of attitude change, 'The incorporation of physiological state, communicative attempt, and resulting attitude change could result in a more general theory of communication and persuasion" (p. 174). When we open the "black box" we will discover much that is useful, but, most likely, we will find another black box as well.

Whether physiological measurement is accepted as simply another way, or a better way, or even a necessary way of investigating human communication, some of our colleagues may still not utilize it. Bostrom (1980) discusses our "strong reaction to the study of phenomena which we find unpleasant" (p. 174). Since we seemingly can not intentionally control these processes, why should we study them? Indeed, would not such knowledge be potentially too dangerous to know? If the ability to predict and control humankind was gained through such research we might lose not only the illusion of free-will, but the ability to act freely as well.

It does not follow, however, that ignorance is the best course. Further, the acquisition of such data does not mean the relinquishing of intentionality, or personal control.

Roloff forcefully argues that we have minimal reflection upon our "self" during much communication activity (Roloff, 1980). It may well be that our "noble" vision of man as a rational decision-maker who consciously decides his future behavior is not totally accurate. This does not mean that man does not control himself, however.

Camden (1981) discusses how insights about the communication processes have been gained through psychophysiological experiments. He suggests that intentionality need not be on the level of awareness.

> Psycholophysiological studies do provide evidence that it is highly plausible that even behaviors controlled by the autonomic nervous system (and thus under involuntary control) can be controlled by an individual's conscious intention . . . It is not inconceivable, indeed it is highly probable, that most aspects of human behavior, from an unbuttoned button to even a skin rash are simply the results of an intentional command from one of several independent cognitive control centers (p. 10).

A great deal of evidence exists that points out that we can, do, and perhaps must control any physiological processes of which we become aware. Biofeedback research is strong on this point. People can become more effective communicators at all levels if they can make conscious contact with heretofore nonconscious events and states. Most public speaking teachers attempt to have their students become "aware" of their delivery techniques so that they may control them. Interpersonal teachers seek to help their students escape "double binds" by becoming aware of them.

Behnke and Carlile (1971) give more pragmatic reasons for the lack of physiological investigation by our discipline. They suggest we are reluctant to probe this area because the physiological variables are "less accessible, more expensive to measure, and more difficult to quantify" (p. 66). Along this same realistic line of reasoning is the very real

consideration that it takes a great deal of time and effort to become familiar with a new methodology.

The Present

Much has changed since Behnke and Carlile published their insightful statement. Modern technology has made great strides in making physiological processes more accessible. Numerous procedural debates have been waged in various disciplines concerning the appropriate measurement techniques and subsequent interpretation strategies. The cost factor has likewise decreased. Most campuses already have purchased the equipment to measure a multitude of physiological variables, though these instruments most likely are in the possession of the physiology, physical education, or biology department (as well as in many "back-sliding" psychology departments). Of even greater importance, perhaps, is the availability of various "how to" treatments within our own discipline. Chapters in several recent books do much to help the speech communication researcher gain the necessary backgroud to pursue physiological inquiry. Behnke's chapter on "Psychophysiological Technologies" (1970) would provide a somewhat dated starting place that could be updated and augmented by reading Dominick and Fletcher (1982) and the excellent chapter by Beatty (1984). We can be somewhat territorial and allow that it is the province of the phycist and physiologist to discover how to bring the data to the surface of the organism. We can then be content to use the data within the field of communication.

The task of weaving physiological processes into the fiber of our theories already has begun, as attested by the presentations of our other

panel members. We have incorporated physiological linkages in our theories, have developed measurement devices to probe these connections, and have operationalized physiological variables as independent, dependent and contingent variables. Some of us even knew we were doing it!

However, within our field, we have only scratched the surface. When physiological variables do appear, by and large it is as mediating theoretical links. Some theories of the effects of televised violence suggest arousal as a link between violence and behavior (DeFleur and Ball-Rokeach, 1982). Dissonance theory and cognitive consistency theories in general suggest that a form of phenomenological clash produces arousal which leads to attitude or behavior change (Feldman, 1966). Much of the theorizing on shyness and communication apprehension relates situational and perception-of-situation variables to an intervening arousal state (Zimbardo, 1977; McCrosky, 1970). The link between credibility and retention has a physiological basis (Roberts and Steinfatt, 1983). These and similar theoretical links remain largely untested.

This paucity of illustrated significant findings could prove to be the impetus that will motivate our discipline to expend the energy required to move into this area. The territory is ripe for exploration.

Future Avenues of Research

Future physiological investigations have the potential of providing the Occam's Razor that many of our reductionist colleagues have been seeking. Focusing on the nervous system rather than on the overt behaviors that are a consequence of changes within the individual will allow us to investigate the communicator as he develops and moves from situation to

situation, while retaining a consistent dependent referent. We will be able to probe areas that are not open to our self-report instrument. Direct testing of developmental language and thought processes may be possible. As Johnson (1983) has argued, we need to examine the development processes of the human communication system if we wish to understand the nature of speech communication. If we wish to analyze and understand something as complex as human communication, "there has to be a consideration, in a systems sense, of all the factors which together form and influence the development of human communication" (Johnson, 1983, p. 201).

Physiological measurement has been touted for a number of reasons in addition to the new territories it opens for our study. Physiological devices are stable and reliable, and the measures can be monitored over time in a continuous fashion (Shapiro and Crider, 1969). Further, physiological measures are patterned. "There are both reliable interindividual and reliable interstressor differences in the patterns of activation" (Lacey, 1956, p. 156).

Mechanisms currently available allow us to measure changes in the central nervous system, the limbric system, and the autonomic system. Such changes are ubiquitous. "One cannot stimulate the organism, however innocuously, without producing some evidence of disturbance of . . . equilibrium" (Lacey, 1956, p. 125). These changes are held to relate to theoretic constructs such as emotional arousal, habituation, orienting, attention, frustration, recall, anxiety, prejudice, attitudes, and cognitive efficiency.

Based on the recent history of the utilization curve of physiological measurement, it seems safe to predict an increase of such measures to tap these concepts. The advertising industry measures attention by looking at pupil response. Heart rate is seen by them as an index of both attention and anxiety. Attention to and arousal by ads is further tapped by measuring respiration rate, blood pulse volume, skin conductance, and skin resistance. Educational program testing also makes use of electrodermal response, electrocardiograms, and photoplethysmography. Pretesting of instructional programs allows educators to ascertain the attention value and retention-prompting potential of packaged communication materials.

In the future, physiological measurement will allow for the monitoring of students who are being instructed via pretested packages. Such observation will locate students who are not attending or processing the information effectively. Staff could be directed to those classrooms experiencing problems to directly intervene. Both the feedforward and feedback functions of physiological data might increasingly be used by our field to good purpose.

Perhaps the most exciting use of physiological data collection is as a method for validating, refining, and reducing the body of communication theories now extant. In the area of persuasion, attitude change, and behavior modification alone there are hundreds of competing theories and thousands of often contradictory "significant findings" some of which may be reducible to a parsimonious physiological theory. It may be as simple as "that which gains (physiological) attention, persuades." Antecedents of arousal could be located for specific sub-cultures, or psychological

types. Self-report instruments and unobtrusive observational techniques to locate and identify these groupings could be validated using physiological measurement. Persuasive campaigns could be monitored using those same techniques. Given the trend towards the demassification of our channels of communication, such an approach would have great application possibilities.

Similarly, a rather lengthy debate has been, and continues to be held concerning the nature of "stage fright," speech anxiety," "communication apprehension," or "whatever." We, as a discipline, seem to be unable to agree as to what to call this phenomenon. While physiological investigations will not be able to resolve the labeling dispute, they could be used to identify and differentiate among various types of arousal and validate observational and self-report measures of the phenomenon as well as monitor the progress of communicators engaged in remediating their deficiencies.

As a final argument for physiological research conducted by reputable scholars in communication, the use of physiological methods by pseudoscientists will survive and prosper to the extent that legitimate science does not enter the marketplace of ideas and research to drive them out. Certainly the study of lying is the province of communication research. But aside from rare exceptions (e.g., Motley, 1974), most research in deception by communication scholars has followed a non-physiological model (Knapp, Hart, and Dennis, 1974; Bauchner, Brandt, and Miller, 1977). This is not to argue that non-physiological research should not be done. Both the Knapp, et al, and Bauchner, et al, studies have been genuine contributions to communication research. Rather it is to insist that we should not abdicate from avenues of physiological research in lying.

The most popular physiological device for the detection of deception is the polygraph. The FBI alone conducted 1900 polygraph examinations in 1979 (New York Times, 1980) and is currently expanding its use of the polygraph each year by over 30%. During the 1970's there was "an unmistakable trend among state courts to re-examine old decisions forbidding the use of polygraph test results as evidence (New York Times, 1980)." And federal and state courts combined provide far less than half of the extremely lucrative market for polygraphers in this country. Yet the polygraph is notoriously unreliable (Barland, et al, 1976; Bersh, 1969; Horvath, 1977; Kubis, 1973; Lykken, 1979, 1981). Why do the courts, the justice department, and the thousands of businesses which employ the polygraph each year to determine the acceptability for continued employment of countless workers, put such faith in a device and its operators whose alpha probability consistently runs over .25 and whose beta probability is essentially unknown? Is it possible that the failure of communication researchers to test the polygraph and publicize their findings has added to the impression on the part of the courts and the general public of the consent of the academic communication research community by its silence? Lykken lists several characteristics common to polygraphers, the foremost of which is "ignorance of basic physiological facts (1981, 479)." To what extent is this appellation equally true of communication researchers and our graduate programs in communication research? To what extent should it remain true in the future?

If the situation is bad concerning the polygraph, what is the case with the PSE? According to International Moneyline "Ultimately, the PSE could affect human communication the way the development of the atomic bomb affected

warfare (Holden, 1975)." Yet how much published research from the academic communication research community have we seen on the PSE and its descendants since that time? In the most extensive testing of the PSE to date, Kubis (1973) found it to be far less accurate in detecting deception than even the polygraph, in fact, no better than chance. Similar results have been reported elsewhere (Holden, 1975; Rice, 1978). Yet the PSE is used to ruin thousands of careers each year in addition to those whose character is assassinated by the polygraph (Rice, 1978). The attitude of the academic communication research community seems to be that the negative results obtained with the PSE and polygraph are reasons for failing to study them or other physiological measures of deception. When compared with the vast potential and actual harm produced by the interpretation of such physiological devices in a modern technological society, this attitude seems accurately characterized as head-in-the-sand. It is not sufficient for one or two studies to be published demeaning the PSE and polygraph. Both social tradition and pseudo studies by the adherents of these methods are apparently far more powerful arguments in the public and legal mind than a few studies by social scientists. Researchers in human communication need to publish a sufficient set of interrelated studies in the physiological detection of deception to be credible to the world outside our own isolated community.

Summary

In sum, there is great potential for many exciting discoveries in the area of physiological variables in communication research. Many of the problems of past data collection of physiological measures are being eased by the linking of microcomputers to physiological measuring instruments. Many of our

theories and theoretical derivations derive from or involve physiological variables and thus demand the testing of such variables. Physiological variables can be measured with a degree of precision and accuracy usually unattainable with our more common forms of communication measurement. They provide a form of hard data which links the study of communication phenomena more firmly to the real world.

While the potential of physiological measurement is great, it would be as fatuous for us to rely solely on it as it has been to rely so heavily on paper and pencil reports of internal happenings. Because every stimulus perceived by the individual causes some internal disequilibrium, these measurement techniques are more appropriate in the laborabory where the environment can be held somewhat constant. In concert with other research approaches, physiological inquiry has value. It is but one "candle" we can use to light the darkness. With its help Lacey's vision of many years ago, while not yet a picture of our past, will become a historical benchmark. "We are at the very edge of knowledge. A vast area of ignorance faces us, to challenge (our) efforts" (Lacey, 1956, p. 156).

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